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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,330	03/30/2004	Jong-myeong Lee	5649-1205	5124
20792 7590 01/23/2007 MYERS BIGEL SIBLEY & SAJOVEC PO BOX 37428 RALEIGH, NC 27627			EXAMINER EVERHART, CARIDAD	
			ART UNIT	PAPER NUMBER
			2891	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		01/23/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/813,330

Applicant(s)

LEE ET AL.

Examiner

Caridad M. Everhart

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 19 and 20 is/are allowed.
- 6) ☒ Claim(s) 1 and 6-18 is/are rejected.
- 7) ☒ Claim(s) 2-5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Response to Arguments

Applicants have argued that Teo does not teach "forming a conductive layer on the portion of the barrier layer inside the intaglio pattern and on the upper surface wherein the conductive layer comes in contact with the barrier layer and the upper surface and that Teo does not teach "to expose an upper surface of an oxide layer included in the mold layer and wherein the conductive layer comes in contact with the barrier layer and the upper surface. Applicants further argue that Teo was overcome in the response of Dec. 8, 2005.

Considering the last argument first, the examiner has applied Teo because by reconsideration of the Teo reference the examiner believes that the Teo reference satisfies the limitations of the rejected claims.

With respect to the first and second arguments, these arguments are respectfully found to be not persuasive for the following reasons. It is shown in Fig. 3C that Teo teaches the removal of the flowable material from inside and outside the opening or intaglio pattern. It is seen that the barrier layers are also removed by CMP from the top of the oxide layer(Fig. 3C and col. 4, lines 45-54). The limitation of the conductor which is then deposited coming in contact with the top of the insulation layer is satisfied because the conductor may be more than one layer. The Ti/TiN layer which is then deposited under the tungsten layer is an additional barrier/glue layer combination under the tungsten layer(col. 4, lines 65-67). This Ti/TiN layer is understood to be a part of the composite conductive layer. The conductive layer may include only the Ti layer(col. 7, lines 1-8). For these reasons it is believed that Teo anticipates the rejected claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 6, 11, 12, 13, 16, and 17 are rejected under 35 U.S.C. 102(b) as being anticipated by Teo(US 5,970,374).

Teo discloses the steps of forming an insulative layer of BPSG over a patterned metal or conductive layer in a substrate(col. 7, lines 8-14 and Fig. 3C and 4C show substrate 10 with conductive region 12 or conductor 54 on the substrate). An opening is formed in the insulative layer(col. 7, lines 15-18), which is an intaglio pattern. A barrier is formed of Ti or TiW or TiN or a bilayer of Ti and TiN(col. 3, lines 30-38). A protective layer of SOG is formed on the barrier(col. 5, lines 65-67 and col. 6, lines 1-5). CMP is used to remove the layer of SOG and barrier layers on the dielectric, while leaving the SOG in the opening(col. 4, lines 48-58 and Fig. 3B). The SOG is removed from the opening(col. 4, lines 58-62 and Fig. 3C) after the polishing step. Then the opening is filled with tungsten(col. 5, lines 4-9) or by aluminum (col. 6, lines 45-50). The plug is then planarized(col. 5, lines 8-33). The SOG is removed using an HF solution, which is a fluoric acid containing solution(col. 4, lines 59-63).

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

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Claims 7, 8,9,10, 14, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Teo as applied to claim 1 above, and further in view of Anna et al(US2002/0072195A1, cited in the previous Office Action) .

Teo is silent with respect to the etch selectivity of the SOG, with respect to the details of the deposition of the aluminum, and with respect to photoresist as the protective layer, although Teo does disclose that ashing is the method of removing photoresist(col. 4, lines 12-16), and is silent with respect to the CMP for the tungsten fill layer.

With respect to the selectivity of the SOG, because Teo discloses BPSG as the insulative layer, it is well known in the art that SOG and BPSG have etchants which are selective to one or the other of the two materials, so that it would have been obvious to one of ordinary skill in the art at the time of the invention to have chosen etchants selective to the SOG in order to remove the SOG.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have deposited the aluminum by CVD and reflow in order to fill the opening completely because CVD and reflow of aluminum fill layers is conventional in the art.

Anna et al disclose that photoresist may be used rather than SOG in a protective layer process for protecting partially filled openings(paragraph 0101) and that the tungsten fill is planarized by CMP.

It would have been obvious to one of ordinary skill in the art at the time of the invention to have used photoresist and to have planarized by CMP in the process taught by Teo as disclosed by Anna et al because the photoresist would serve the protective

function just as SOG does in the process taught by Teo and because CMP is conventional in the art in the planarization of tungsten fill layers.

Allowable Subject Matter

Claims 19 and 20 are allowed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


CARIDAD EVERHART
PRIMARY EXAMINER

C. Everhart
1-12-2007